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EDITORIAL

Bencini L, Adinolfi E. Minimally invasive approaches to small gastric stromal tumors: The less with the more. *World J Gastrointest Surg* 2025; 17(5): 101823 [DOI: [10.4240/wjgs.v17.i5.101823](https://doi.org/10.4240/wjgs.v17.i5.101823)]

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REVIEW

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ORIGINAL ARTICLE**Case Control Study**

Hu MM, Ding YL, Li J. Effectiveness of early enteral nutrition support in patients undergoing gastrointestinal perforation repair surgery within the enhanced recovery. *World J Gastrointest Surg* 2025; 17(5): 106384 [DOI: [10.4240/wjgs.v17.i5.106384](https://doi.org/10.4240/wjgs.v17.i5.106384)]

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LETTER TO THE EDITOR

Du QC, Bai Y, Nian H. Integrating clinical and molecular approaches to improve survival in esophageal squamous cell carcinoma. *World J Gastrointest Surg* 2025; 17(5): 104235 [DOI: [10.4240/wjgs.v17.i5.104235](https://doi.org/10.4240/wjgs.v17.i5.104235)]

RETRACTION NOTE

Feng R, Cheng DX, Song T, Chen L, Lu KP. Retraction note: Efficacy and safety analysis of transarterial chemoembolization and transarterial radioembolization in advanced hepatocellular carcinoma descending hepatectomy. *World J Gastrointest Surg* 2025; 17(5): 105113 [DOI: [10.4240/wjgs.v17.i5.105113](https://doi.org/10.4240/wjgs.v17.i5.105113)]

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AIMS AND SCOPE

The primary aim of *World Journal of Gastrointestinal Surgery* (WJGS, *World J Gastrointest Surg*) is to provide scholars and readers from various fields of gastrointestinal surgery with a platform to publish high-quality basic and clinical research articles and communicate their research findings online.

WJGS mainly publishes articles reporting research results and findings obtained in the field of gastrointestinal surgery and covering a wide range of topics including biliary tract surgical procedures, biliopancreatic diversion, colectomy, esophagectomy, esophagostomy, pancreas transplantation, and pancreatectomy, *etc.*

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Observational Study

Results of endoscopic retrograde cholangiopancreatography procedures at surgical clinics: A multicenter observational study in Türkiye

Sezgin Yilmaz, Esat Taylan Ugurlu, Alpen Yahya Gumusoglu, Mahmut Said Degerli, Kemal Dolay, Emre Balli, Yasin Kara, Ali Kocataş, Ekrem Çakar, Bünyamin Gürbulak, Sercan Yüksel, Soykan Arikan, Hasan Bektaş, Yusuf Emre Aytin, Doğan Albayrak, Ali Fuat Kaan Gok, Cemalettin Ertekin, Alpaslan Fedayi Çalta, Serhat Oğuz, Mustafa Örmeci, Ali Haldun Özcan, Barış Sevinç, Ömer Karahan, İhsan Tümkaya, Osman Kones, Mehlika Bilgi Kirmaci, Mustafa Yavuz, Emrah Akın, Merve Yeşilsancak

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Abstract

BACKGROUND

Endoscopic retrograde cholangiopancreatography (ERCP) is an invasive endoscopic procedure used mainly to treat hepato-pancreato-biliary (HPB) diseases. The need for ERCP has increased with the rising number of HPB diseases over the past decade. Thus, due to increased demand, ERCP is performed at more centers. Currently, it is performed by general surgeons, gastroenterology and invasive radiology specialists in the United States and Europe as recommended by the British Society of Gastroenterology (BSG).

AIM

To present the results of ERCP procedures from fourteen surgical centers in Trkiye.

METHODS

Fourteen surgical centers performing ERCP were included in the present study. The age, gender, ERCP indication, success status, post-ERCP complications, ERCP reports and the files of 66993 patients who underwent ERCP were collected from the participating centers. The results are discussed according to the targets declared by the BSG, which are volume load per annum, proportion of successful cannulation (> 85%), bile duct clearance rate (> 75%), stenting rate for strictures (> 80%) and complications (< 6%).

RESULTS

A total of 66993 ERCP procedures were performed in the centers included in the study up to August 2024. 29250 (43.6%) of the procedures were performed urgently, especially for suppurative cholangitis, biliary tract injuries, *etc.* The remaining 37743 (56.4%) cases were performed electively. 50.2% of the patients were female and 49.8% were male. The average ages were 56.5 years for women and 55.9 years for men. General anesthesia was used in 84.1% of the patients while sedation was used in 15.9%. The indications were bile duct stone (78.7%), pancreatic tumor (3.9%), papillary tumor (3.3%), cholangiocarcinoma (2.6%), Oddi sphincter dysfunction (2.4%), bile leakage after cholecystectomy (2%), bile leakage after hydatid cyst surgery (1.9%), biliary stricture (1.7%), and other diseases (3.1%). Hyperamylasemia and post-ERCP pancreatitis were the most common complications as observed in 8.1% of the patients. They were usually self-limited and responded to supportive measures. The frequency of the other complications was also consistent with the literature.

CONCLUSION

There is a huge shortage of ERCP endoscopists worldwide due to insufficient ERCP training and centers especially in developing and underdeveloped countries. As patients requiring ERCP usually present to surgical practitioners, the incorporation of surgeons into this training program is an effective and reliable solution. The BSG recommends the incorporation of surgeons and radiologists in addition to gastroenterology specialists. This study is the first to present the results of ERCP procedures from fourteen surgical centers throughout Trkiye. The results suggest that the surgical centers included were able to achieve the targets set by the BSG. This study demonstrated that the surgical ERCP units in the present work have reached satisfactory results and provided a reliable and successful ERCP service. There are currently no issues regarding the validity and

appropriateness of the surgeons performing ERCP. Therefore, ERCP training should be encouraged in surgeons and more surgical ERCP centers should be provided.

Key Words: Endoscopic retrograde cholangiopancreatography; General surgeon; Education; Endoscopic retrograde cholangiopancreatography training; Surgical centers; Endoscopic retrograde cholangiopancreatography endoscopist

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Core Tip: The present article assesses the results of all endoscopic retrograde cholangiopancreatography (ERCP) procedures performed in fourteen surgical centers included in the study. This study was a retrospective, multicenter, observational study and no statistical evaluation was performed. Age, gender, ERCP indication, success status, post-ERCP complications, ERCP reports and the medical files of 66993 patients who underwent ERCP were collected from these centers. The results are discussed according to the targets announced by British Society of Gastroenterology, which are annual volume load, successful cannulation rate (> 80%), bile duct clearance rate (> 75%), stent rate for stenoses (> 85%) and complications (< 6%). All patients who underwent ERCP in the participating centers were included in the study. Both elective and emergency procedures were recorded and there were no exclusion criteria.

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INTRODUCTION

Endoscopic retrograde cholangiopancreatography (ERCP) is an invasive endoscopic procedure used mainly to treat hepato-pancreato-biliary (HPB) diseases. Although developing imaging methods such as magnetic resonance imaging and magnetic resonance cholangiopancreatography (MRCP) replaced the role of ERCP, it is still used for diagnostic purposes. As the diagnostic value of magnetic resonance imaging/MRCP is low especially in patients with bile duct stones ≤ 5 mm in size and patients with Oddi sphincter dysfunction and benign strictures, ERCP is also used for diagnosis [1]. The need for ERCP has increased with the rising incidence of HPB diseases over the past decade[2]. Thus, increased demand has resulted in ERCP being performed at more centers. It is a technically challenging procedure which requires an intensive training process mainly under the supervision of an experienced endoscopist mentor[3].

It is used for elective treatment of certain diseases as well as urgent situations. Bile duct stones and malignant biliary stenoses are the most commonly seen indications for elective ERCP procedures. Bile duct clearance is extremely high following ERCP for patients with biliary stones; De'Ath *et al*[3] reported in a recent work that bile duct clearance was achieved in 80% of patients after ERCP. Additionally, ERCP has a superior role in decompressing malignant obstructions over percutaneous transhepatic cholangiography since the latter has higher infectious complications and mortality rates [4]. Emergency cases mainly have cholangitis, biliary pancreatitis and surgical bile duct injuries (bile fistulas or jaundice after cholecystectomy), but sporadic cases with for example biliary system parasites or T-tube breakage may be encountered[5-7]. ERCP can also be valuable for bridging to subsequent cholecystectomy in patients with severe cholecystitis or Mirizzi syndrome[8,9].

As ERCP has significant morbidity and mortality (up to 1%) rates, several precautions have been recommended to decrease the adverse events and to improve procedure success. Endoscopist experience, ERCP volume of the center, technical facilities and patient-related conditions are the proposed factors affecting morbidity and mortality. Various targets related to both endoscopist and center need to be achieved to provide the optimal results. Endoscopist and center volume should be above 75 and 200 yearly, successful cannulation rate should be above 85%, stone clearance in the bile duct should be above 85% and complication rates should be less than 6%[10].

Numerous complications (up to 15%) can occur after ERCP, 1%-2% of which are serious. Ugurlu[11] reported an overall complication rate of 17.4% including patients with hyperamylasemia. When the hyperamylasemia cases were excluded, the complication rate was 8.1%. Pancreatitis, ascending cholangitis/sepsis, bleeding and perforation are well described complications after ERCP. However, the unusual and unexpected complications related to a stuck basket, stent migration or the duodenoscope itself may be detected for which management is difficult[12]. Also non-procedural complications such as cardiopulmonary depression, hypoxia, aspiration and adverse drug reactions can occur. The European Society of Gastrointestinal Endoscopy described ERCP-related complications as follows: (1) Pancreatitis: Newly or worsened abdominal pain combined with amylase or lipase values (> three times the normal) for more than 24 hours and the requirement for hospital admission or prolongation; (2) Cholangitis: New onset of temperature > 38°C for more than 24 hours combined with cholestasis; (4) Cholecystitis: Right upper quadrant signs of inflammation, images demonstrating the findings of acute cholecystitis, systemic signs of inflammation; (5) Bleeding: Hematemesis and/or

melena or hemoglobin decrease > 2 g/dL; and (6) Perforation: Presence of gas or any gastrointestinal system content outside the gastrointestinal lumen depicted by radiological methods[13]. Close monitoring and repeat abdominal examinations are important to detect and manage post-ERCP complications.

Although ERCP is a technically challenging procedure and associated with potentially severe complications, several studies have reported that it can be safely performed even in elderly patients, children and in pregnancy once specific precautions are ensured[9,14-16]. The clinician should evaluate and re-check the indication and potential benefit of ERCP in these groups in which certain anatomical and physiological differences may be observed. Anesthesia plays an important role in the initial step of ERCP to ensure optimal papilla positioning and eventual successful cannulation. However, despite the increased number of ERCP procedures performed, anesthesia type and protocols are still not standardized. The collaboration of anesthetist/endoscopist and the clinical status of the patient will determine the type of anesthesia. Nowadays, general anesthesia and deep sedation are usually used depending on the center's preference[17].

Selective cannulation of the bile duct is the main crucial step for successful ERCP and is a prerequisite to obtain maximum benefit. Despite the advances in ERCP devices including specific guides, rotatable sphincterotomes and stents, even experienced endoscopists may fail to cannulate the papilla due to various reasons. Diverticular papilla, ectopic placement, ampullary tumor and abnormal anatomy due to gastric surgery are examples resulting failure[18]. Repeating the procedure within a few days after the initial failed ERCP is recommended before contemplating more invasive interventions[19]. The ERCP procedure which was first developed by the surgeon McCune in 1968 is now performed by general surgeons, gastroenterology and invasive radiology specialists in the United States and Europe. The issue of who performs ERCP is determined by national laws, rules of professional associations, Ministry of Health legislation and patient demand.

Although ERCP has achieved great progress over the last few years, there is still a shortage of both ERCP-endoscopists (ERCPist) and centers throughout the world especially in developing countries. Therefore, several training programs are available to supply this demand, which include various training periods (one year, 6 months, 4 months). Following the training courses there are follow-up targets to evaluate the adequacy of the program with the help of feedback responses[20]. In Türkiye, ERCP is performed mainly by general surgeons in addition to gastroenterology specialists. ERCP training is provided through a 6-month one-by-one training program during general surgery residency. There is also another education program directed by the Turkish Surgical Society (TSS) for general surgeons after residency as post-graduate education. The present study investigated the results of ERCP procedures carried out in fourteen general surgery departments in Türkiye with the guidance of the British Society of Gastroenterology (BSG) ERCP standards framework[10].

MATERIALS AND METHODS

Study centers

The present study shows the results of all ERCP procedures performed at the fourteen general surgery centers included. This was a retrospective, multicenter and observational study and no statistical evaluation was conducted. The age, gender, ERCP indication, success status, post-ERCP complications, ERCP reports and medical files of 66993 patients who underwent ERCP were collected from the participating centers. The results are discussed according to the targets declared by the BSG, which are volume load per annum, proportion of successful cannulation ($> 80\%$), bile duct clearance rate ($> 75\%$), stenting rate for strictures ($> 85\%$), and complications ($< 6\%$). All patients who underwent ERCP in these centers were included in the study. Both elective and urgent procedures were recorded and there were no exclusion criteria. The annual ERCP case load of all fourteen centers included in the study was 70-500 ERCP procedures. These centers provide health services to a population of approximately 20 million people. Two responsible authors were identified from all centers and the data obtained were the responsibility of individual authors. The data obtained from the centers were combined in an Excel file and the cumulative results were calculated.

ERCP clinicians

All ERCPs were performed mostly by general surgeons and rarely by gastrointestinal surgeons. The centers had performed ERCP for 2-15 years. The clinicians usually received their ERCP training during residency or by post-graduate training organized by the TSS and were rarely trained abroad. Twenty-seven of the participants were academics, while the others were general surgery specialists working in a public or private hospital.

ERCP procedure

ERCPs were routinely performed under general or deep sedation anesthesia, depending on the preference of the center, anesthesiologist, and ERCPist. The patients were routinely placed in the left lateral decubitus position except one with situs inversus. Routine antibiotic use and rectal diclofenac administration varied between centers.

RESULTS

A total of 66993 ERCP procedures were performed in the participating centers up to August 2024. 65747 (98.1%) of them were performed by Fujinon, 920 (1.4%) using Olympus and 326 (0.5%) using Pentax imaging systems. 29250 (43.6%) of the procedures were performed urgently, especially in patients with suppurative cholangitis, biliary tract injuries, *etc.* The

remaining 37743 (56.4%) cases were performed electively. 50.2% of the patients were female and 49.8% were male. The average ages were 56.5 years for women and 55.9 years for men. There were additional comorbidities in 48% of the patients. The average length of hospital stay was 8.91 days. General anesthesia was used in 84.1% of patients, while sedation was used in 15.9%. The general features of the patients and procedures are depicted in [Table 1](#).

Hemogram-biochemistry studies, ultrasonography, computed tomography and MR/MRCP images were obtained to determine the clinical diagnoses of the patients. The indications were bile duct stone (78.7%), pancreatic tumor (3.9%), papillary tumor (3.3%), cholangiocarcinoma (2.6%), Oddi sphincter dysfunction (2.4%), bile leakage after cholecystectomy (2%), bile leakage after hydatid cyst surgery (1.9%), biliary stricture (1.7%) and other diseases (3.1%) ([Table 2](#)). Hyperamylasemia and post-ERCP pancreatitis (PEP) were the most common complications at 8.2%, which was consistent with those observed in the literature. These complications were usually self-limited and responded to supportive measures. The other complications encountered are listed in [Table 3](#).

DISCUSSION

There is a huge shortage of ERCP endoscopists worldwide due to insufficient ERCP training and centers[20]. As patients requiring ERCP usually present to a surgical practitioner and eventually undergo surgical resection or palliation, the incorporation of surgeons into the training programs is an effective and reliable solution. The BSG recommends the incorporation of gastrointestinal surgeons and radiologists in addition to gastroenterology specialists. This study is the first to present the results of ERCP procedures from fourteen surgical centers throughout Türkiye. The results suggest that the surgical centers involved were able to achieve the targets set by the BSG[10]. There is a significant increase in the demand for ERCP due to gradually rising health problems related to hepatopancreatobiliary diseases. In Türkiye, ERCP, which was first performed in 1977, is also performed by general surgeons in addition to gastroenterology specialists as of 1993. Nowadays, nearly two hundred general surgeons are carrying out ERCP procedures. Between 15000 and 20000 patients require ERCP and the number of ERCP procedures performed by general surgeons is around 9500-10000 annually.

In developed countries the ERCPist-to-population ratio is 20-50 per 1000000 inhabitants; thus, there is a shortage in Türkiye in terms of ERCPists, and new ERCP training programs and centers should be arranged to overcome this problem[20]. The apprenticeship model is the basis of ERCP training but simulation-based programs are also recommended to accelerate the learning curve and to decrease the procedural risks[21]. However, these programs are not available everywhere. Although the training programs are held as fellowship after specialization in Western countries, general surgery residents are able to achieve this during residency in some centers in Türkiye. There is also another training program organized by the TSS as a postgraduate fellowship program. Of the 29 ERCP specialists included in this study, 15 of them have received ERCP training and certification from the program organized by the TSS. Others received their training during their general surgery residency or by an education program abroad.

ERCP training in Türkiye lasts six months and is basically hands-on training. In the first two months, the trainee is taught pre-procedural preparation of the patient and theoretical training and observes the ERCP procedures carried out by the mentor. In the following two months, trainees should achieve competence in basic ERCP procedures and cannulation of the post-sphincterotomy papilla. Finally, the remaining skills including cannulation of the native papilla, stenting, biopsy and stone extraction are acquired through one-on-one training under supervision by the mentor. ERCP providing centers and ERCPists should ensure acceptable target points to deliver reliable health services. There should be a minimum of 75 procedures for an ERCPist per year and a minimum of 150 procedures for the center. Individual ERCPists in a center should be able to cannulate the virgin papilla > 85%, extract the common bile duct stone > 75% and place the stent successfully through the extrahepatic stricture and provide the cytology in > 80% of cases[10].

Considering the results of the centers included in this study, it can be seen that the cannulation success rate was 90.8% and this rate is in line with the rates determined by the BSG. ERCP referral centers should be integrated with HPB sections that can be performed by HPB surgeons and invasive radiologists. There are advantages in general surgeons performing ERCP, as many of them are HPB surgeons and have close relationships with invasive radiologists and intensivists. We believe that the surgeon-led ERCP also accelerates the surgical treatment process in some cases. The present study revealed that 24 out of 28 participants were HPB surgeons and they perform interventions in patients with surgical complications after ERCP.

Although ERCP has a strong therapeutic potential, it carries a risk of significant complications, some of which can be serious. The complication rate should be below 6% according to the BSG and was 10.1% in this study ([Table 3](#)). Hyperamylasemia and PEP were the most common complications as observed in 8.2% of patients, consistent with results in the literature. These complications were usually self-limited and responded to supportive measures. Although it is not within the scope of this article, female gender, previous pancreatitis, previous PEP, suspected Oddi sphincter dysfunction, younger age, non-dilated common bile duct, normal bilirubin values, ERCPist's experience and abnormal anatomy of the papilla are factors in the development of PEP[11,21]. The rate of hyperamylasemia in this study was 4.7% and is consistent with that shown in the literature. Ascending cholangitis is an infectious complication following ERCP and is observed between 0.4% and 10% of patients, who usually respond to antibiotic therapy. In this study, 0.9% of patients developed cholangitis after ERCP.

Bleeding is rarely seen after ERCP (0.3%-2%) and usually results due to sphincterotomy. Fortunately, it does not produce serious hemodynamic consequences and responds to local measures such as balloon pressure, adrenalin injection, *etc.* In this study, 346 (0.5%) patients developed bleeding and laparotomy was performed in only two patients. The most feared complication of ERCP is perforation, and fortunately most patients can be treated without surgery.

Table 1 General features of the patients, procedure and the centers, *n* (%)

Characteristic		Value
Mean age, years	Female	56.5
	Male	55.9
Average length of hospital stay, days		8.91
Gender	Female	33633 (50.2)
	Male	33360 (49.8)
Number of participants in the clinic with high or low volume	> 200 (high)	12 (86)
	< 200 (low)	2 (14)
Process	Urgent	29250 (43.6)
	Elective	37743 (56.4)
Anesthesia	General anesthesia	56367 (84.1)
	Sedation	10626 (15.9)
Preop rectal diclofenac administration	Yes	20085 (29.9)
	No	46908 (70.0)
Comorbidity		32188 (48.0)
Successful cannulation rate		60830 (90.8)
Complication rate		3651 (5.6)
Complete bile duct clearance rate of bile stones		44334 (84)
Successful stenting of malignant or benign strictures		1850 (82)
Pre-cut at the beginning or throughout the procedure		10107 (15.0)

Table 2 Indications for ERCP in the patients, *n* (%)

Indications	Value
Bile duct stone	52778 (78.7)
Pancreas tumor	2627 (3.9)
Papillary tumor	2238 (3.3)
Cholangiocarcinoma	1755 (2.6)
Oddi sphincter dysfunction	1654 (2.4)
Bile leakage after cholecystectomy	1401 (2.0)
Bile leakage after cyst hydatid surgery	1320 (1.9)
Biliary stricture	1143 (1.7)
Other	2077 (3.1)
Total	66993 (100)

Although the incidence ranges from 0.3% to 1.3%, mortality may be as high as 37.5%. Conservative treatment is emphasized in post-ERCP perforations and surgery is required only in highly selected groups[22,23]. In this study, perforation was observed in 0.15% of patients. This result is consistent with those observed in the literature.

The procedure volume of both center and endoscopist significantly impacts the results and a high volume for the center > 200/year and endoscopist > 75/year are associated with an increased success rate and lower complications[2]. In this study, the volume in the centers varied between 70 and 500 (twelve centers had a high volume while two centers had a low volume); however, the rate of successful cannulation and complications in these centers was similar to the others. It should be noted that, in addition to the endoscopist and center volume, patient-related factors and technical developments are also among the factors affecting cannulation success and complication rates. For example, it is known that more complex and previously unsuccessful cases are referred to tertiary centers thus decreasing the procedure success. We consider that the acceptable rates of complications in the present study are closely related to center/endoscopist volume, anesthesia management and staff experience.

Table 3 Complications, n (%)

Complications	Value
Hyperamylasemia	3142 (4.6)
Acute pancreatitis	2370 (3.5)
Cholangitis	594 (0.8)
Bleeding	346 (0.5)
Stent migration	198 (0.2)
Perforation	105 (0.15)
Stone basket entrapment	38 (0.05)

CONCLUSION

This study demonstrated that the surgical ERCP units in the present work reached satisfactory results and provided a reliable and successful ERCP service. There are currently no issues regarding the validity and appropriateness of the surgeons performing ERCP and there are enough data confirming this. Therefore, ERCP training should be encouraged in surgeons and more surgical ERCP centers should be provided.

FOOTNOTES

Author contributions: Yilmaz S, Ugurlu ET designed and prepared the study, collected data and wrote the manuscript; Gumusoglu AY, Degerli MS, Dolay K, Balli E, Kara Y, Kocataş A, Çakar E, Gürbulak B, Yüksel S, Arıkan S, Bektaş H, Aytin YE, Albayrak D, Gok AFK, Ertekin C, Çalta AF, Oğuz S, Örmeci M, Özcan AH, Sevinç B, Karahan Ö, Tümkaya İ, Kones O, Bilgi Kirmaci M, Yavuz M, Akın E, and Yeşilsancak M contributed to collection of the data and preparation of the manuscript.

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